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Higher Education and Female Labour Market Participation

An Empirical Study with Evidence from Chile

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* I want to express my deepest gratitude to the Swedish International Development Cooperation Agency (SIDA) and the Department of Economics at Lund University for the incredible opportunity of conducting my own minor field study in Santiago de Chile. Furthermore, I want to thank all respondents who took their time to answer my survey, without whom this thesis would not have been possible.

Abstract

While female labour market participation is increasing worldwide, the development in Chile is slow and concentrated to the capital city of Santiago de Chile. Education has been found to increase female labour market participation in several studies, where my thesis contributes to the research with more careful analysis of the effects of higher education. Rather than analysing the joint effect of higher education, I disentangle the effects of different types of institutions of higher education, which allows me to analyse each corresponding effect on female labour market participation. By using data from the national census, and comparing results from the probit model and the linear probability model, I show that university education has the highest effect on female labour market participation, that education at technical centres has a slightly smaller effect, and that education at professional institutes has the smallest effect. Furthermore, by complimenting the thesis with my minor field study (MFS) about women's policy preferences, I am able to discuss policy implementation with better foundation and support than studies that only rely on economic theory. My results suggest that policies that aim to simplify a combination of family life and career may be an efficient way to increase female labour market participation among women with higher education, where the MFS emphasise work concerning the quality of day care centres. Lastly, the highest valued policy in the MFS is work aiming to reduce the gender wage gap, which when implemented may decrease the impact of cultural values on labour market decisions, and thus further increase labour market participation among women with higher education.

Key words: Higher education, female labour market participation, policy preferences, probit model, linear probability model.

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1. Introduction

Gender equality is a core area in the field of development economics and a central topic worldwide. In 2012 The World Bank subjected their annual report accordingly, *The World Development Report 2012: Gender equality and development*, and explains that gender equality is improving globally, but highlights that gender gaps are more persistent in areas such as labour market participation, wage, and time spend on housework and care. In a number of countries, including Chile, institutional constraints and social norms continue to reinforce gender gaps despite steady economic growth, stable governance, and public policies (The World Bank, 2012).

While gender equality is one problem, long term economic growth is another. In 2013 the Centro Latinoamericano y Caribeño de Demografía (CELADE) presented that demand for labour is increasing in Chile. CELADE explains that if demand for labour increases without a change in labour supply, it will lead to increased wages. Increased wages increase production costs, which reduce Chile's competitiveness in foreign markets. Consequently, the low female labour market participation rate may come to negatively harm the country's long term economic growth (CELADE, 2013). A distinctive characteristic of the Chilean labour market is that although women invest in education at the same extent as men, a significant part of the women with obtained degrees from institutions of higher education choose housework instead of seeking employment (Stange et al. 2011, p. 280). In 2010 the United Nations Development Programme (UNDP) examined gender equality in Chile. Among the women 78 percent answered that they are solely or mainly responsible for the housework, while 52 percent of the men answered that they do not have any responsibility for the housework (UNDP, 2010).

Numerous empirical studies have found that education has a positive effect on female labour market participation (Borjas, 2013, p. 237). This combined with the characteristics described above encourages more research in the area, where a careful analysis on the relationship between higher education and female labour market participation not has been done. Further, in studies that treat the topic of female labour market participation, policies are often suggested solely after economic theory. What I additionally contribute with through a completed minor field study (MFS) is knowledge of which policies women with higher education actually want to see implemented. A deeper understanding about how institutions of higher education affect female labour market participation combined with evaluation of policy preferences enables for more successful policy implementation and consequently a more efficient labour market. The

purpose of this thesis is thus to evaluate the relationship between different types of higher education and female labour market participation and further evaluate preferences of policies among women with higher education. By doing this I contribute to better comprehension of the relationship of education and female labour market participation, and the development of more efficient public policies. This in turn may help Chile maintain its steady long term economic growth, competitiveness, and increase gender equality.

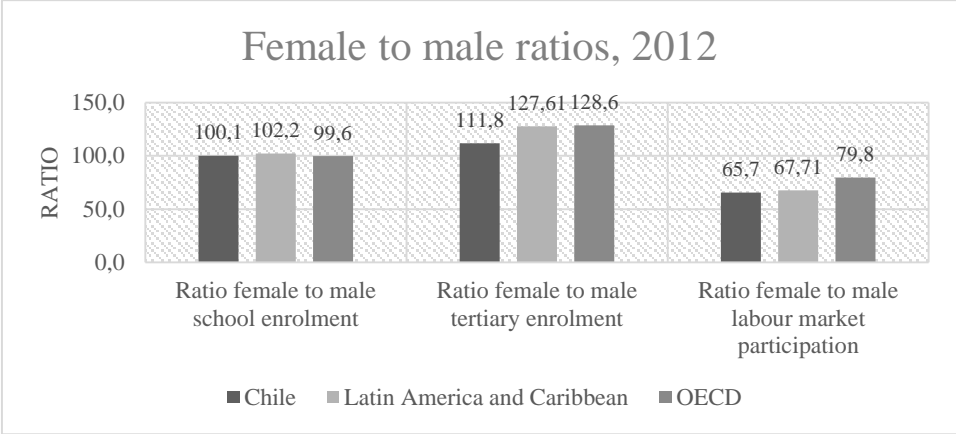
I complete the purpose by analysing micro data provided by IPUMS-International, based on the Chilean national census. The analysis is done using two econometric models, the binary probit model and linear probability model. The dependent variable is labour force participation and the main variables of interest is education at different institution of higher education. A set of control variables are also included, all frequently analysed in labour market research.

The thesis is structured in six sections, where this introduction is the first. The second section shortly presents characteristics of the Chilean labour market and the system of higher education, and further summarises important findings in the MFS. The third section presents economic theory and empirical research. The fourth section covers the methodology in detail and describes the data. The methodology is followed by the fifth section of results, while the sixth section discusses the results and presents conclusions.

2. Background

While the educational system in Chile historically have displayed a gender equal environment in all levels, the labour market does not show the same characteristics.

Graph 1: Female to male ratios



Source: Data from The World Bank, 2015

Graph 1 illustrates 2012 female to male ratios for enrolment rates in primary and secondary school (denoted school in graph), enrolment rates for higher education, and labour market participation for Chile, the Latin American and Caribbean average,¹ and the OECD average.² For education on primary and secondary level there are only very small differences in enrolment rates between genders and groups, whereas all three groups of countries show that more women than men are being enrolled in education at higher level. However, when the labour market is looked upon all three groups show a fairly low female participation rate, where the female to male participation ratio in Chile is the lowest one with the reported ratio of 65.7 (The World Bank, 2015).

¹ Latin American and the Caribbean countries in statistics: Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela (The World Bank, 2015).

² OECD countries in statistics: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States (The World Bank, 2015).

In Chile, women in the age group of 25-34 are the most likely to participate in labour market activities (Stange et al. 2011, p. 280). Also frequently discussed is the gender wage gap. Women earn on average 30 percent less than men for the same job, with the rare trend of an increasing wage gap with level of education. At tertiary level Chile has the largest gender wage gap in the OECD with women earning only 62 percent of what men do (OECD, 2014).

The characteristics described above further motivates the need for my thesis. Additionally, to enable for a good analysis and valuable conclusions, it is necessary to be aware of how the Chilean educational system works, which is presented next.

The Chilean educational system has undergone large changes on all levels during the last three decades, but as this thesis is about higher education I will focus on the related reforms and current system. Since 2003 primary and secondary schooling is mandatory and completed after 12 years, after which students choose to work or to continue studying at an institution of higher education. There are three officially recognised institutions of higher education in Chile: universities, professional institutes, and technical centres, where students obtain academic degrees, professional diplomas, and technical diplomas respectively. Other institutions such as military schools also exist, but are not formally categorised as institutions of higher education. The current system was implemented in 1980. Until the 1980's the Chilean higher education consisted of eight public universities with state funding. After 1980 private actors were allowed to open institutions without state funding and many of the existing universities were reconstructed (CNED, 2015). During this reform tuition fees were introduced, which today are among the highest in the world. With the new system, the number of institutions increased, the program and course offers increased, and the enrolment rate increased. The eight original universities became 25 public universities, and during the first decade 35 private universities, 80 professional institutes and 190 technical centres were created. (CNED, 2015). In the labour market there is a rather strong hierarchy where individuals with university education generally have the highest positions, individuals with education from professional institutes slightly lower, and individuals with education at a technical centre yet a little lower (WENR, 2013).

In 2012, 80 percent of all institutions of higher education were private. The eight oldest universities are generally considered the most prestigious, followed by the 17 traditional universities created in 1981. Although all institutions of higher education are evaluated regarding quality, it is known that private institutions generally have a lower standard. A degree from a university can be obtained after a five year program of academic studies. A professional

institute tend to be smaller than a university and more specialised. The studies often have more practical characteristics than studies at universities, but more academic than studies at technical centres, where diplomas can be obtained after four years. Technical centres tend to be the smallest institution and offer less programs than the other institutions. A diploma can be obtained after 2 years, when the students have gained practical skills for a specific trait. Universities generally have the highest tuition fees and technical centres the lowest tuition fees (WENR, 2013).

2.1 The Minor Field Study

As mentioned in the introduction, this thesis is also complimented by a minor field study (MFS). For context and better understanding of the Chilean labour market it is useful to be aware of the MFS throughout the thesis, which is why I summarise the most important content here while the whole MFS is found in appendix II.

The purpose of the MFS is to measure how female students perceive gender equality in the labour market, to evaluate how important they believe that active work towards a more equal labour market is, and to measure how they value different policies that aim to increase female labour market participation. The two first questions allow for a more accurate and nuanced presentation of the Chilean labour market from the perspective of female students, but the most important part is the evaluation of how they value different policies, which may contribute to more well-developed and efficient policies.

I complete the purpose by distributing a survey to students at different institutions of higher education in Santiago de Chile. The main results are that female students perceive the labour market as unequal in regards to gender and that they find active work towards a more gender equal labour market very important. Regarding policies the results show that the students generally are very positive towards all traditional policies that are used to increase female labour market participation. The highest valued policies are no gender wage discrimination and improved quality of day care centres.

To enable for efficient policy implementation it is important to consider what women, who the policies are meant for, want. Without consideration, the policies may be inefficient or even wasteful. Therefore, the MFS is of vital importance later on in this thesis when the results from the regression analysis are discussed and policy suggestions are developed.

3. Economic theory and previous research

This section aims to explain underlying economic theory and to summarise important research in the field. First, theory of investment in education is briefly explained for necessary comprehension, where the aim is to understand the labour market implications. The second part presents more careful theory of female labour market participation and related research and the last part of this section summarise important findings regarding the Chilean labour market.

3.1 Investment in education

The schooling model, or human capital model, assumes that individuals choose the level of education that maximise the present value of lifetime earnings, where education solely is considered a mean to increase future earnings. Acquiring human capital is associated with two types of costs; the opportunity cost of forgone earnings and the cost of the education such as tuition fees and material. Educational attainment is thus determined by the trade-off between lower earnings today and higher earnings in the future, limited by financial and institutional constraints of access to education. To calculate the present value of lifetime earnings a discount rate influenced by time preferences is used, which may explain why some individuals choose to invest a lot in education while others do not. It has been suggested that poor individuals and countries have a higher discount rate than wealthy individuals and countries as a result of worse access to education and help from home. This imply that poor individuals have to put more effort into obtaining an education, and accordingly invest less in education. Relaxation of these financial constraint, eg. introduced student aid or student loans, interpreted as a decrease in individual's discount rate where individuals become less presently oriented has been examined in several studies to see how it affect investment in education, for instance. The majority of the empirical evidence suggest that the relaxation lead to more investment in education (Borjas, 2013, p. 235-241).

Investment in education is primarily driven by returns to education. During the last three decades female educational attainment has increased rapidly, and in many developed countries women have both caught up with and surpassed male educational attainment. This has led economists to wonder if returns to education are higher for women. However, the empirical results are vague and it seems ambiguous that rates of returns to education have such a large explanatory as women still work less hours than men at all levels of education (Pekkarinen, 2012).

Human capital models state that investment in education and labour market skills will be lower among individuals who expect to spend less time in the labour market. This implies that women

who intend to spend extensive time on housework are less likely to study something with a primary value in the labour market. The theory is compatible with the observed development in most developed countries the last three decades. As birth rates and marriage rates have declined, so have gains from gender based specialisation and comparative advantages, and women accordingly choose to participate more in the labour market (Altonji and Blank, 1999, ch. 48).

So far, human capital theory does not provide any explanation to why the same educational attainment should have different consequences depending on gender, both men and women choose their level of education to maximise the present value of their lifetime earnings. The same is true for the more general version of the model where the assumption is that individuals choose the level of education that maximise the present value of lifetime utility. Thus, instead of only obtaining utility from future earnings individuals also obtain utility from being in a stimulating environment, meeting friends with similar interests, and a possible future spouse (Borjas, 2013, ch. 6). Yet, gender differences are not explained and in the case of investment in higher education the theories imply that after a completed degree, women in the same rate as men seek to participate in labour market activities. Because this is not reflected in the Chilean labour market, next part presents theory of female labour market participation.

3.2 Female labour market participation

There are many models of labour supply and labour market decisions. In the simplest model, labour supply is derived from individuals who maximise utility, a trade-off between consumption and leisure, restricted by time and a budget constraint. This model in its simple form does however not explain the observed gender differences or the development of female labour market participation (Borjas, 2013, p. 52). In addition to the individual utility maximising labour supply literature, there are theories that incorporate individuals in larger decision making units for labour supply. One of the most important models of the decision unit theories is the chauvinistic model. The chauvinistic model assume that one partner, almost exclusively the male, maximise household utility by making all labour supply decisions of the unit independent of his spouse. The woman then makes her labour supply decisions according to her spouse's exogenously given constraints regarding her time for housework, leisure, and labour market activities. The model has successfully predicted many labour market outcomes, where the most important one is that labour market participation is more likely for men than women (Bosworth et al. 1996, p. 54-55).

Old theory regarding gender differences in the labour market instead explain that differences in wage, occupation, or employment are consequences of different preferences and skills. The main idea is that genders differ in their preferences for labour market activity, housework, and leisure. The main weakness of the theory is that it does not explain origins of gender based preferences or why these preferences have evolved over time, which is needed to be able to explain the observed labour market development. One emphasised reason is pre-market gender discrimination in parental practices or in educational systems, where parents or teachers invest differently in skills between boys and girls. Differential treatment between boys and girls may however also be a rational response to an unequal labour market. If parents or teachers know that women face discomfort in traditionally male occupied sectors, it may lead them to shape girls into being comfortable in their traditional gender role (Altonji and Blank, 1999, chapter 48). Generally, the theory of gender specific preferences are fairly undeveloped, and the reasoning is foremost used as a complement to newer models. Newer models incorporate education, wage rates, relative wages, fertility, technology, and disability as determinants for female labour market participation, and lately culture and institutions have gotten more attention (Borjas, 2013, p. 52).

The relationship between education and female labour market participation has been subject to several studies. In the Netherlands, the increased participation rate is often explained by institutional environments with a developed taxation system, pensions, and qualitative public healthcare. Schettkat and Yocarini (2001) use a model of direct utility of work where the model recognise that work is associated with both conventional material rewards, e.g. wage, and non-material rewards, e.g. being in a stimulating environment, to challenge these views. They find that the institutional environment only contribute to the increased rate at the margin. Their results show that the increased proportion of women with higher education has had a substantial effect on female labour market participation. The increased attainment of higher education in the Netherlands generated a pool of potential labour supply which became active when labour demand increased. Further, higher valuation of labour market activities, greater flexibility, and part-time opportunities also contribute to the increase (Schettkat and Yocarini, 2001).

Klasen and Pieters (2012) examine female labour market participation in India where they evaluate the determinants for the increased participation rate between the years of 1983-2005. India has similar to more developed countries falling fertility rates, but unlike developed countries a strongly increasing GDP. Klasen and Pieters (2012) show that the increased participation rate is explained by increased economic opportunities, thus returns to education,

according to theory, but also by a larger need to seek work for the purpose of survival. By looking at trends in employment and earnings, they estimate on unit level that only women with the highest education levels experience what they call a *pull* effect from better economic opportunities, while women with lower education experience a *push* effect where they participate in the labour market because they have to. The results suggest that the labour market conditions for women have not improved substantially in India, which frequently has been argued alongside the increased participation rate (Klasen and Pieters, 2012).

Over the same time frame as female labour market participation has increased, wages in several developed countries also have increased. Theory explain that higher wages gives non-working women greater incentive to focus more time on labour market activities as leisure and housework become relatively expensive activities. Smith and Ward (1985) investigate the increasing female labour market participation in the United States (US) by using time serie data for the twentieth century. They estimate that 60 percent of the total growth in the female labour market participation rate between 1890 and 1980 can be explained by the increased real wages. They further explain that half of the effect is due to reduced fertility, which is another effect of the higher real wages (Smith and Ward, 1985). Attanasio et. al. (2008) challenge the findings and state that the increase in female labour supply only can be explained by increased real wage if it is accompanied by reductions in costs of raising children, and that a smaller gender wage gap also is contributing. They use a life cycle model of female labour market participation and savings which they calibrate to cohorts born in the 1940's and 1950's in the US. They compare cohort statistics and estimate the variables effect on female labour market participation by calculating which effect that is needed to achieve the observed labour market developments (Attanasio et. al. 2008).

In developing countries, real wages has weaker explanatory power. Instead decreased reservation wages have been used to explain the increased female labour market participation rate (Borjas, 2013, p. 51-52). Having children increase a woman's reservation wage and accordingly decrease the probability that she will work. Cogan (1978) use a comparative econometric framework to evaluate determinants of married women's labour supply. He finds that the probability that a woman participates in the labour market decreases by almost 20 percentage points if she has children under the age of six (Cogan, 1978).

Reduced fertility is also argued to increse female labour market participation. Between 1950 and 2000 the total lifetime fertility of the average adult woman declined from 3.3 to 2.1

children. The causality however runs in both directions. Women participate more in labour market activities because they have fewer children and spend less time on child caring, but they also participate more as a result of higher market wages which makes child rearing a relatively expensive activity (Borjas, 2013, p. 52). Recent empirical studies challenge this view and show that this negative correlation not always is a fact. In Europe, and especially in the Nordic countries, more monetary support from the state to working mothers are found to have large effects on labour market decisions. Part-time opportunities, child benefits, parental leave, and subsidised child care diminish the incompatibilities between motherhood and careers (Del Boca and Locatelli, 2008). Del Boca and Locatelli (2008) distangle the effects on the joint decision of labour market participation and fertility by examining microeconomic data that explore the effect public policies. They present that public policies have large explanatory power for explaining incompatibility between employment and child rearing across countries in Europe, and further state that family background, the time the husband spend in the household, and culture also are important determinants (Del Boca and Locatelli, 2008).

Technological progress, with inventions such as microwaves and washing machines, diminish the required time spent on household production, leaving more time for leisure and labour market activities. If a household experience large differences in the marginal product of housework between spouses, one part is likely to specialise in home production. The technological advances is likely to reduce the gap in marginal productivity on household work and reducing the need of specialisation, consequently contributing to higher female labour force participation rates (Borjas, 2013, p. 52).

Oguzoglu (2011) analyse the effect of different degrees of disability on labour force participation by evaluating a self-reported scale of work limitations. He states that if the distinction between individuals with some limitation and individuals who are incapable of working is ignored, any analysis is misleading. He uses a dynamic model and estimates the impact of work limitation of varying degrees on labour market participation, where the model controls for lagged participation, previous health conditions, and unobserved heterogeneity. The results suggest that differences in severity levels of disability have significant explanatory power of the participation rates among disabled individuals. Additionally he explains that while the effects of a disability generally is negative, the effect may differ depending on gender (Oguzoglu, 2011).

Culture has lately been discussed more frequently regarding its impacts on female labour market participation. The variable is hard to measure, and consequently there is little empirical economic research. However, some studies incorporate nativity status as a proxy of culture (Borjas, 2013, p. 52). Antecol (2003) analyse female labour market participation in Europe, the Middle East, Asia, Oceania, and North America where she foremost is interested in effects of culture. The cultural impact is captured by a proxy constructed by a set of questions regarding men's attitudes towards family and gender roles. She finds that women are more likely to participate in labour market activities if her spouse shows greater cultural acceptance of such behaviour (Antecol, 2003).

After this section it is clear that female labour market participation is determined by many different variables and can be modelled in various ways. To construct a good model and complete thorough analysis it is important to be aware of them all.

3.3 Female labour market participation in Chile

Even though female labour market participation is a fairly new area of research in Chile, the positive relationship between education and participation has been touched upon. Pardo (1987) was among the first in Chile to put together descriptive statistics over demographic, social, and economic variables to evaluate how they affect female labour market participation. She estimates correlations between the variables and found a significant positive correlation between educational levels and participation rates (Pardo, 1987).

Contreras et. al (2005) analyse how female labour market participation has evolved in Chile between the years of 1957-1997. They use a pseudo panel by constructing synthetic cohorts of women between the ages of 16-60 where they detangle the effects on participation by age, year, and cohort. A study of cohorts allows observation on average labour market activities by observing statistical characteristics over time. Their main conclusion is that age has the largest impact on female labour market participation, where they present a concave age curve where the highest rate of participation is at the age of 36 years. The concave curve shows that women enter the labour market more until a certain age, then they exit for childbearing and childcare, after which some women enter the labour market again while some do not and the curve is decreasing. The year effect shows how business cycles affect female labour market participation. They show that when GDP decrease with greater magnitudes, it has a significant negative effect on female labour market participation. Lastly, the cohort effect suggest that women who belong to younger generations will participate in greater extent. The authors

additionally conclude that female labour market participation is positively related to education levels and negatively related to number of children. They also explain that even though female labour market participation is increasing in Chile, the increase is primarily driven by a large increase in Santiago de Chile. Santiago de Chile has the largest population and the largest economic activity which contributes to the development, while some rural areas show no increase in the participation rate of women (Contreras et. al, 2005).

Several authors have also argued that the strong machista culture in Chile affect female labour market participation and that culture should be incorporated in empirical studies alongside normal variables of age, education, number of children, marital status, and geographic. Guzmán and Mauro (2004b) describe that even though liberal attitudes are growing, especially in larger cities such as Santiago de Chile, the traditional family structure with a strong male authority is still the most common. To investigate this the authors identify three types of relationships. In the first one, both spouses organise the family around two working parents and the woman makes her labour market decisions independently of her spouse. In the second type of relationship both spouses work because of necessity, where the type is found solely in lower socioeconomic levels of the society. In the last type of relationship the woman's labour market decisions depend on her spouse, where she participate in the labour market in accordance to her family's needs, as seen from her spouse. This is thus the chauvinistic model of labour supply. The authors conclude that the third type of relationship is the most common type in Chile, where their data present the very common beliefs that "*family life will suffer when the woman works full time*", and "*it is likely that a pre-schooler will suffer if his mother works*". A majority of the men consider housework and child caring to be activities that hinder labour market participation, and subjected their female partners with the responsibility of said activities. The men further strongly associate being the provider with having family authority, and subjected themselves with the main responsibility of provision. (Guzmán and Mauro, 2004b). Additional studies on culture and labour market participation has been done by Contreras et. al (2010). They explain that culture and social norms in Chile strongly emphasise gender roles. To incorporate culture in their analysis they develop two indexes, where the first measures to what extent a woman has adopted machista cultural values and the second if a woman can be described as conservative or moderately conservative. They find that the older the population, the more widespread is the adoption of machista cultural values, and that the higher level of education, the lower is the adoption of machista cultural values. Further, married women and women with lower income also adopt the machista cultural values to a higher extent than single

women and more wealthy women. Regarding conservatism they find that it increase with age, and is more visible among married women. Women with less education and lower income are found more conservative than women with higher levels of education and income. They further discuss the problem of endogeneity, as the relationship is likely to run in both directions. Cultural and social norms is likely to affect female labour market participation, but increased labour market participation is also likely affect social norms, which may result in biased results. Contreras et. al (2010) present that education has a positive impact on female labour market participation and that having young children and being married makes it less likely that a woman participate. Regarding the cultural variables, women who have adopted more machista cultural values and women who were found more conservative are less likely to participate in labour market activities (Contreras et. al, 2010).

After reviewing literature on female labour market participation in Chile it can be established that many studies have found a positive relationship between education and female labour market participation. My thesis is different from these previous studies in mainly two ways. First, I evaluate the effects of different institutions of higher education on female labour market participation, and accordingly contribute to a larger understanding of the relationship. Second, for policy recommendations I rely both on economic theory and my MFS which result in more well-founded suggestions and enables more efficient implementation.

4. Material and empirical methodology

4.1 Data

The data that is used in the regression analysis is micro data provided by IPUMS-International, which is based on the 2002 national census and includes 1.514.000 individuals. A randomised sample of 68 197 individuals is collected for the analysis. A concern regarding the data is that it is not entirely new, and the 2002 national census is likely to not have captured the latest developments in Chile. It is however the most recent available data containing this amount of information and I believe that it is sufficient for a good analysis.

4.1.1 Variables

The dependent variable is labour force participation and indicates if an individual was part of the labour force or not during a reference period of a week prior to the census. One imply that the individual is part of the labour force, while zero imply that the individual is not. Both employed and unemployed individuals are part of the labour force, following the unemployment definition where unemployed individuals are individuals who are out of work but actively seeking employment. An individual not part of the labour force is considered inactive, where the individual can be studying, retired, unable to work, or engaged in housework (IPUMS, 2015).

For higher education the data contains information of highest completed level of education, e.g. six years of university studies, two years of university studies, four years of studies at a professional institute, two years studies at a technical centre etc. (IPUMS, 2015). For older generations with a different system of higher education IPUMS International converts the data to the level equivalent to current system. For any analysis to be possible, I assume that individuals who have studies at least five years at a university have obtained a university degree, that individuals who have studied at least four years at a professional institute have obtained a professional diploma, and that individuals who have studied at least two years at a technical centre have obtained a technical diploma. It is possible, and even likely, that some individuals finish their studies quicker which will result in them not being counted, and also that some individuals take longer to finish their studies which will result in them being counted even though they have not obtained a degree. To reduce this risk of measurement error it would be possible to instead, or for robustness, use average time of completion of the different studies, this was however not available for me. While I recognise that these assumptions are strong, I believe that they provide sufficient results for a valuable analysis to be made. Furthermore, similar assumptions about higher education are made by IPUMS International where they use

certain years of schooling to compare higher educational attainment between countries (IPUMS, 2015).

Additionally the data contains information about years of schooling, the individual's gender, age, civil status, children, nativity status, religious belonging, disability status, and geographical location. These control variables are chosen because they often are analysed in research about female labour market participation, and all mentioned in section three. Age is included in two ways, the first is the individual's age and the second is the individual's age-squared. By including both variables the relationship between age and labour market participation can be observed more realistically, where it is likely that labour market participation increases with age but only to a certain point, after which it decreases again. For civil status the variable contains information of whether or not the individual is married. Regarding children the data contains information about number of children under the age of five. Nativity status shows whether or not an individual is native Chilean and is used as a proxy for culture. An alternative proxy for culture is religious belonging. Chile is a Christian Catholic country and the religious status indicates whether or not an individual is part of the Christian religion. Disability status is also included as a control variable. Geographical location is a variable that indicates whether or not an individual lives in the province of Santiago de Chile. Chile has 54 provinces, but as mentioned in section three, Santiago de Chile is by far the province with the largest population, with the most economic activity, and where female labour market participation has increased the most.

Table 1 on the next page presents the variables, their abbreviations for notation in equations and tables, what type of variable it is, and what sign the variable is expected to show in the regressions to be consistent with previous research mentioned in section three.

Table 1: The variables

Variable	Abbreviation	Type	Expected sign
Labour force participation status (dependent)	lf	dummy	
Obtained university degree	uni	dummy	+
Obtained diploma from professional institute	prof	dummy	+
Obtained diploma from technical centre	tech	dummy	+
Years of schooling	ysch	continuous	+
Age	age	continuous	+
Age-square	age ²	continuous	-
Marital status	mas	dummy	-
Number of children younger than 5 years	ch5	continuous	-
Nativity status	na	dummy	-
Religious belonging	re	dummy	-
Disability status	disa	dummy	-
Geographical location	geo	dummy	+

4.2 Methodology

To evaluate the relationship between higher education and female labour market participation I use two econometric models, the probit model and the linear probability model (LPM). The probit model uses maximum likelihood (ML) estimation and is commonly used in empirical studies for regressions with binary outcomes, while the LPM use OLS for estimation. Both models have labour force participation as dependent variable and in addition to the variables of higher education a set of control variables are included.

The probit model estimates how different variables affect the probability that the dependent variable takes the value one, in this case that the individual is part of the labour force, when the independent variable change. The model is based on the standard normal cumulative distribution function where the regression line follows an S-shaped curve and approaches the values of zero and one asymptotically to ensure that estimated probabilities never are negative or larger than one. Under regular conditions the ML estimator have valuable asymptotic properties when the sample is large, including that it is weakly consistent, asymptotically efficient, and asymptotically normal.

Equation 1 and 2 below shows how the probabilities for labour market participation are estimated in the probit model, where ϕ is the standard normal cumulative distribution function.

(Eq. 1)

$$P(Y = 1|uni, \dots, geo) = \phi(Z)$$

(Eq. 2)

$$Z_i = \beta_1 + \beta_2 uni_i + \beta_3 prof_i + \beta_4 tech_i + \beta_5 ysch_i + \beta_6 age_i + \beta_7 age_i^2 + \beta_8 ch5_i + \beta_9 mas_i + \beta_{10} na_i + \beta_{11} disa_i + \beta_{12} geo_i + \varepsilon_i$$

The LPM is linear on the right side, while the left is a probability, hence the name. Interpretation of the estimated coefficients is however still straightforward, the coefficients show how the probability that the dependent variable equals one change when the independent variable change all other things held constant. The usage of the linear probability model is likely to result in estimates that are non-binary, which consequently cannot be interpreted in any valuable manner, and because of the linearity values close to the bounds of zero and one are often less reliable. Furthermore, with a binary outcome important assumptions of homoscedasticity and normality are violated in the OLS estimation process (Wooldridge, 2009, p. 246-250) However, with a sufficiently big sample the standard errors are very small and do not cause any problems. Similarly, with a sufficiently large sample, the residuals follow a normal distribution despite the binary outcome (Noreen, 1988 and Hellevik, 2009). The LPM is further only intended to approximate the true probability for one explanatory variable at the time, while the probit model estimates probabilities which are functions of all explanatory variables. It is also known that the usage of a LPM often result in low R-square even though the model in fact may explain the relationship well.

Equation 3 shows the LPM, where the probability is conditioned on one explanatory variable and not all combined as the probit model.

(Eq. 3)

$$\begin{aligned} P(Y_i = 1| uni, \dots, geo) \\ = \beta_1 + \beta_2 uni_i + \beta_3 prof_i + \beta_4 tech_i + \beta_5 ysch_i + \beta_6 age_i + \beta_7 age_i^2 \\ + \beta_8 ch5_i + \beta_9 mas_i + \beta_{10} na_i + \beta_{11} disa_i + \beta_{12} geo_i + \varepsilon_i \end{aligned}$$

Despite these rather big differences between the models, only very small differences are observed in empirical work (Wooldridge, 2009, p. 246-250). I argue that my sample is large

enough to solve possible problems with heteroscedasticity and to provide normally distributed residuals when the LPM is used.³ Heteroscedasticity is still a possible problem for the probit model, where the large sample does not help. Further, I argue that the usage of both the probit model and the LPM makes the results more reliable. More robust results are of great importance as the variables of interest are subject to endogeneity, which is discussed more thoroughly in section 4.3. The described methodology allows examination of whether or not different institutions of higher education have different impacts on female labour market participation.

4.3 A discussion about endogeneity

So far, I have emphasised the effect of higher education on female labour force participation in various ways. It is however obvious that increased female labour force participation also affect higher education, and that the variables are subject to endogeneity. To illustrate the endogenous relationship consider following; as female labour force participation increase, returns to education become more obvious for women in the society, and as an effect investments in higher education increase. This is likely to be true for the control variables as well. Therefore I do not claim to estimate a causal effect of the different types of higher education on female labour market participation, rather I evaluate the relationship between higher education and female labour market participation by observing the coefficients signs and relative sizes. This part aims to clarify the consequences of including endogenous variables in the analysis.

Technically, the problem of endogeneity arise when the error terms are correlated with the explanatory variables. The reversed causality cause two problems. The first problem is biased coefficients related to higher education's effect on female labour force participation which makes the size of the coefficients unreliable. The second problem of including endogenous variables is that it may affect the estimation of the control variables (Wooldridge, 2009, p. 88). To deal with the endogeneity in my cross-section data an instrument variable (IV) approach may be used for estimation with the LPM, but as I have no instrument available I do not solve this problem.

As a consequence of the endogenous relationship the sizes of estimated coefficients are not discussed in detail. Nevertheless, as the size of the bias depend on the degree of endogeneity, the estimates from the cross-section data are not entirely dismissed. Based on previous research regarding the effect of education on female labour market participation I argue that the estimated signs and relative sizes still are interesting for conclusions.

³ See Hellevik (2009), Noreen (1988), and Wooldridge.

5. Results

5.1 Descriptive statistics

Table 6 in appendix I presents descriptive statistics of the data sample. 52.3 percent of the individuals are part of the labour force. The number is quite low, but among non-participants are also children, students, and retirees. To account for children and retired individuals, only individuals in the ages of 16-65 are considered in the regression analysis. 16 is the age where it is legal to work, and 65 is the retirement age. Labour force participation differs significantly between genders, only 35.7 percent of the women are part of the labour force compared to 70.1 percent of the men. 5.8 percent of the population have some type of higher education. For women, 3 percent have obtained a university degree, 0.8 percent a professional diploma, and 1.6 percent a technical diploma. The men have slightly higher educational attainments with 3.8 percent having obtained a university degree, 0.9 percent a professional diploma, and 1.4 percent a technical diploma. Years of schooling range from 0 to 18 years, where the average completed years also are slightly higher for men with 8.6 years compared to women's average of 8.5 years. The sample's mean age is 31.6 years, which is quite young. Women are somewhat older with a mean age of 32.4 years. Number of children below the age of 5 ranges from 0 to 5 children. 40.5 percent of the sample report that they are married and 98.6 percent report that they are native Chilean. 87.4 percent report that they belong to the Christian religion, slightly more women than men with 90.3 percent compared to 84.3 percent. 2.2 percent of the sample report that they are disabled, and 31.8 percent live in the province of Santiago.⁴

5.2 Results

Table 2 and 3 on the following pages present the regression outputs for six regressions. Labour force participation is the dependent variable in all regression. The estimation in regression 1, 2, and 3 is done using the probit model while estimation for regression 4, 5, and 6 is done using the LPM.

Regression 1 and 4 contain the whole sample, regression 2 and 5 only contain women, and regression 3 and 6 only contain men. In the columns to the right of regression 1, 2, and 3 the marginal effects are presented for the probit model. Both models with their corresponding explanatory variables independent of sample are significant on a 99 percent significance level.

⁴ See table 6 in Appendix I: Tables

A division of the samples in regards to gender increases the pseudo R-square and R-square values, where the highest values are obtained for the samples containing only men.

Table 2: Probit model regression output

Variables	(1)		(2)		(3)	
	lf	dy/dx	lf	dy/dx	lf	dy/dx
uni	0.377*** (10.47)	0.148 (*)	0.430*** (8.511)	0.161 (*)	0.197*** (3.460)	0.061 (*)
prof	0.243*** (3.902)	0.096 (*)	0.123 (1.426)	0.043 (*)	0.360*** (3.253)	0.103 (*)
tech	0.196*** (4.252)	0.078 (*)	0.260*** (4.380)	0.095 (*)	0.243*** (2.742)	0.073 (*)
ysch	0.0492*** (27.69)	0.020	0.0806*** (30.04)	0.028	0.0192*** (6.693)	0.006
age	0.164*** (73.10)	0.065	0.159*** (45.99)	0.055	0.208*** (61.59)	0.068
age ²	-0.00191*** (-74.64)	-0.001	-0.00187*** (-45.86)	-0.001	-0.00246*** (-64.96)	-0.001
ch5	0.0110 (0.751)	0.004	-0.0859*** (-4.242)	-0.030	0.427*** (11.70)	0.139
mas	-0.150*** (-10.31)	-0.060 (*)	-0.595*** (-29.64)	-0.206 (*)	0.368*** (14.30)	0.121 (*)
na	-0.00981 (-0.192)	-0.004 (*)	-0.134* (-1.848)	-0.048 (*)	0.0666 (0.836)	0.022 (*)
disa	-0.820*** (-16.96)	-0.295 (*)	-0.717*** (-8.330)	-0.193 (*)	-1.232*** (-19.76)	-0.462 (*)
geo	0.0314** (2.347)	0.013 (*)	0.0818*** (4.283)	0.028 (*)	0.0133 (0.601)	0.004 (*)
Constant	-3.322*** (-48.81)		-3.654*** (-36.34)		-3.551*** (-34.15)	
Observations	49,648		25,566		24,082	
Pseudo R ²	0.163		0.177		0.314	

*** p<0.01, ** p<0.05, * p<0.1; z-statistics in parentheses; marginal effects are calculated with Stata's command 'mfx'; (*) dy/dx is for discrete change of dummy variable from 0 to 1.

Table 3: LPM regression output

Variables	(4) lf	(5) lf	(6) lf
Uni	0.102*** (9.417)	0.178*** (11.66)	0.0288** (2.345)
prof	0.0837*** (4.254)	0.0855*** (3.053)	0.0669*** (3.053)
tech	0.0776*** (5.171)	0.134*** (6.941)	0.0486*** (2.638)
ysch	0.0181*** (30.69)	0.0255*** (32.67)	0.00536*** (7.578)
age	0.0449*** (73.19)	0.0348*** (43.97)	0.0571*** (75.29)
age ²	-0.000506*** (-78.01)	-0.000383*** (-46.09)	-0.000659*** (-82.11)
ch5	0.0182*** (3.639)	-0.0166*** (-2.605)	0.0833*** (13.20)
mas	-0.0408*** (-8.463)	-0.174*** (-28.39)	0.0938*** (15.21)
na	0.00341 (0.201)	-0.0397* (-1.751)	0.0245 (1.223)
disa	-0.167*** (-13.13)	-0.0848*** (-4.795)	-0.301*** (-20.78)
geo	0.00930** (2.067)	0.0248*** (4.149)	-0.00105 (-0.197)
Constant	-0.484*** (-22.44)	-0.435*** (-15.07)	-0.475*** (-18.64)
Observations	49,648	25,566	24,082
R ²	0.181	0.181	0.340

*** p<0.01, ** p<0.05, * p<0.1; t-statistics in parentheses

5.2.1 Female labour market participation

Regression 2 and 5 analyse female labour force participation. The probit model estimate significant and positive coefficients for university education and education at a technical centre, where university education has the largest coefficient. The coefficient for education at a professional institute is positive but insignificant. The LPM estimate significant and positive coefficients for all types of higher education. Similar to the probit model, university education has the largest coefficient, followed by the coefficient for education at a technical centre, and the coefficient for education at a professional centre is the smallest. The LPM estimates higher coefficients for all the different types of higher education compared to the probit model. Even though the regressions do not show a causal relationship, the results suggest that there is a strong effect of higher education on female labour market participation, where university education

seem to have the largest effect and education at a professional institute the smallest effect if any.

Regarding the control variables both the probit model and the LPM estimate significant coefficients with signs consistent with previous research. The coefficients of years of schooling is positive. The age coefficient is positive while age-square is negative. The coefficients for having young children and being married are negative, which also is the case for culture and being disabled. Lastly, the coefficient for living in the province of Santiago is positive. Whereas the signs are the same between the models, the LPM estimates smaller coefficients than the probit model.

5.2.2 Additional results

In regression 1 and 4 all types of higher education have significant and positive coefficients in both models. Because the variables are chosen to model female labour force participation the control variables are not of any analytical interest, and it is not surprising that some variables are insignificant. In regression 3 and 6, where only men are considered, both models estimate significant and positive coefficients of all types of higher education. The coefficients are however smaller than for women, and the ordering is the opposite where the coefficient for education at a professional institute is the largest and the coefficient for university education is the smallest. The coefficients for years of schooling are significant and positive in both models, but also smaller than for women. Age show a similar significant curve as for the women. The coefficients for having children and being married are significant and positive for men, and the coefficient for disability is significant and negative. The coefficients for culture and living in the province of Santiago are insignificant. The estimated coefficients are smaller when the LPM is used compared to when the probit model is used.

5.3 Robustness

Because I evaluate the relationship between higher education and female labour market participation in the presence of endogeneity, the robustness I want to achieve in this section is regarding the coefficients signs and relative sizes.

Table 7 in appendix I presents five additional regressions with alternative specifications or different variables. Only female labour force participation is considered. Regression 7 and 8 presents a scaled down model with only education as explanatory variables, regression 7 use the probit model and regression 8 the LPM. The scaled down specification impose less assumptions on the models and consequently makes it more general. The main difference with

this specification is that the estimated coefficients are larger than the coefficients reported in table 2 and 3. Furthermore, the coefficient for education at a professional institute is positive and significant in both models. The ranking is the same where the coefficients for university education are the largest and the coefficients for education at a professional institute are the smallest. The pseudo R-square and R-square values are lower than the values reported in table 2 and 3.⁵

Regression 9 and 10 use religious status instead of nativity as a proxy for culture. Regression 9 use the probit model for estimation and regression 10 the LPM. The coefficients for religious belonging are also significant and negative, but larger than the coefficient for nativity in table 2 and 3. Neither religion nor nativity is a perfect proxy for culture, and it is outside of the scope of this thesis to discuss which one is better. What however is of interest is that the estimated coefficients for higher education are slightly lower when religious status is used as proxy compared to when nativity is used. The specification however show the same ranking as in table 2 and 3 where the coefficients for university education are the largest, followed by the coefficients for education at a technical centre. Also similar to table 2 and 3 is that the coefficient for education at a professional institutes is positive, but only significant when the LPM is used.⁶

In the methodology section I discuss the problem with possible heteroscedasticity. In table 4 below I test the LPM for heteroscedasticity using the Breusch-Pagan test for heteroscedasticity.

Table 4: Breusch-Pagan test

Test specifications	H ₀ :	Constant variance
	Variables:	uni, prof, tech, ysch, age, age ² , ch5, mas, na, disa, geo
Test results	$\chi^2(11)$:	756.17
	p-value:	0.000

The test produce a chi-square test statistics with 11 degrees of freedom. The test statistics is in this case 756.17 and the corresponding p-value is zero. This mean that the null-hypothesis of homoscedasticity is rejected and at least one of the explanatory variables suffer from heteroscedasticity. The LPM regression is run with robust standard errors in regression 11

⁵ See regression 7 and 8 in table 7 in Appendix I: Tables

⁶ See regression 9 and 10 in table 7 in Appendix I: Tables

which corrects the standard errors in the presence of heteroscedasticity and autocorrelation. However, because of the large sample there are no differences in the obtained results.⁷

More problematic is however the probit estimator which use a Maximum Likelihood (ML) technique and report inconsistent coefficients in the presence of heteroscedastic residuals. This means that correcting standard errors is insufficient. I test the probit model for heteroscedasticity by doing a likelihood-ratio test using Stata’s “hetprob” command, which is summarised in table 5 below.

Table 5: Heteroscedasticity test in probit model

Test specifications	H ₀ :	Constant variance
	Variables tested:	uni, prof, tech, ysch, age, age ² , ch5, mas, na, disa, geo
Test results	$\chi^2(11)$:	274.64
	p-value:	0.000

Which produce a test statistic of 274.64 and a corresponding p-value of zero, and again the null-hypothesis is rejected and the residuals are heteroscedastic also in the probit model.

⁷ See regression 11 in table 7 in Appendix I: Tables

6. Conclusions

6.1 Some comments about the methodology and future research

To shortly summarise what now is obvious is that both the probit model and the LPM have flaws. While the LPM is likely to be less reliable close to the bounds of zero and one, it is still consistent in the presence of heteroscedasticity. The probit model, although having great large sample properties, is inconsistent in the presence of heteroscedasticity. The endogeneity cause biased estimates in both model, wherefore the exact size of the coefficients is of lower interest. It would be interesting to see future research on the same topic where panel data or an IV approach is used to get more reliable coefficients and where a causal relationship can be estimated. Because the endogeneity cause biased results in both models but only the probit model is inconsistent, I argue that the estimates from the LPM are more reliable even though the models produce rather similar results. The discussion in the next part is therefore based on the results from the LPM.

On a different note, because different countries have different educational systems the external validity of this study is not particularly strong, and consequently it is hard to generalise the results. For future research it would however be interesting to see if similar results can be found in other countries.

6.2 A discussion about the results

The results suggest that higher education is positively related to female labour force participation, which is in line with previous research. The results are significant in multiple specifications, and even though I do not estimate a casual effect I believe my results are robust enough for the term effect to be used in the discussion. For my main results and contribution, university education has the largest effect on female labour market participation, followed by education at a technical centre, while education at a professional institute has the smallest effect. These results are significant and robust in multiple specifications.

If the ranking of the institutions is accepted, and that university education has the largest effect and education at a professional institute has the smallest effect, it is justifiable to wonder why these differences arise. In section three different theories are mentioned that may be used to explain the differences, where one concerns differential treatment of individuals depending on gender. The theory suggest that teachers may invest differently in skills depending on gender, which may affect an individual's preferences for labour market activities. This would imply

that pre-market discrimination is more common at professional institutes, less common at technical centres, and the least common at universities.

The general theory that individuals choose education to maximise lifetime utility is another way to explain the results. If women obtain enough utility from sources such as being in a stimulating environment or meeting interesting people, the theory implies that higher education not definitely must affect female labour force participation, or can affect labour force participation differently if individuals in different institutions obtain utility from different sources. This theory would suggest that individuals who attend professional institutes have significantly different utility functions from individuals who attend universities. The reasoning is rather vague as it does not explain how or why different utility functions would arise. Again it could however be argued that pre-market discrimination in school or home environments may be stronger for women attending professional institutes.

It is further possible to speculate about the efficiency of the professional institutes considering it shows the lowest effect on female labour market participation. If insufficient human capital is acquired at professional institutes, individuals who attend these have a disadvantage in the labour market compared to individuals who have attended universities and technical centres. This would however be easier to argue if individuals attending universities, professional institutes, and technical centres all seek the same type of job, which the labour market hierarchy generally does not allow.

Additionally, and maybe more likely to explain the results is that female labour force participation is determined by other factors. In section three many studies present that culture affects female labour market participation in Chile, and that the relationship type where the woman makes her labour market decisions after her spouse's views is the most common one. Following this line of thought the different sizes of the effects can be explained by a unit labour supply model such as the chauvinistic model. Thus, despite educational attainment, a woman's labour market decisions is strongly influenced by her spouse. Supporting this does also the findings that women with higher education and higher income adapt machista values in less extent than women with lower education and income. University education is the highest level of education, and generally also the most expensive one. If machista values are adopted less at universities compared to slightly lower education levels such as education at technical centres and professional institutes, this can explain why university education has the largest effect on female labour market participation.

To summarise the above, I believe that the different effects of institutions of higher education on female labour market participation may be explained by different theories, and most likely a combination of them where pre-market discrimination, degree of efficiency, and cultural structures that incorporate women into a unit of labour supply have strong explanatory power.

To increase labour market participation for women with higher education, considering this discussion, I argue for especially two measures to be taken. The first is the implementation of a general policy to make sure that institutions of education do not take part in any pre-market discrimination. Even if this may not be the main contributor it is important and fairly simple to implement. A second measure includes implementation of a policy to make women invest more in university education, as university education has the largest effect on female labour market participation the most. This can be done in various ways where a first step may be more information to women about the increased economic opportunities that follow a university education. A more expensive second step may include more beneficial aid or student loans for women who want to invest in a career.

To finish this discussion I want to connect the main results in the thesis to the MFS because it is important to consider what women want for the most efficient usage of policy resources. I believe that policies that aim to make it easier for women to combine family life with a career would be an efficient way to increase female labour market participation among women with higher education. Among these policies are e.g. subsidised child care, but also part time work possibilities could be more heavily emphasised after policies used in Nordic countries. In the MFS women reported that the quality of day care centres was of high importance, more important than cheaper day care centres and more accessible day care centres. This should be carefully noted by policy makers, even though the differences between the policies concerning day care centres were not very large.

A trait of many traditional policies is that they work around cultural structures. As a compliment to these I would like to suggest policies that aim to decrease the impact of cultural values on labour market decisions, and emphasise the advantages of female labour market participation, so that beliefs such as *“family life will suffer when the woman works full time”*, and *“it is likely that a pre-schooler will suffer if his mother works”* at least decrease in the society. One way of doing this is stronger policy work related to reduction of the large gender wage gap, which further was the highest valued policy in the MFS.

Moving on from the main results, the control variables all have significant signs consistent with previous research. Years of schooling has a positive effect on female labour market participation, in line with human capital theory. Age show the normal age-labour force participation relationship where higher age increases the probability of labour market participation to a certain age, after which it decreases it. Having young children has a negative effect on female labour market participation, which is according to theory where children increase a woman's reservation wage. Being married has a negative effect on labour force participation. This can be explained by the fact that single women only have themselves to consider regarding labour supply decisions, while married women are part of a joint household labour supply decision where outcomes often are determined by the spouse. Disability has a negative effect on labour market participation. I do not take into account different severity levels of disability, which is more accurate. However, as disability status is a control variable the status I believe that it is sufficient for the analysis. Culture is also negative for female labour market participation, where I already have discussed how cultural values may influence a joint household labour supply. The choice of using nativity and religion as proxies for culture is mainly motivated because of the accessible data and they are not perfect, but as a control variable I believe they are sufficient. Additionally, although the effect of culture change depending on which proxy that is used, it does not change any results for the variables concerning higher education. Lastly, living in or close to Santiago de Chile has a positive effect on female labour market participation. Larger cities have better economic opportunities, and as liberal attitudes are more accepted in Santiago de Chile than in the countryside it is likely that the joint household labour supply model have weaker explanatory power there.

Regarding the results in the additional regressions all types of higher education are positive and significant. As the variables in the models are chosen to model female labour market participation it is not surprising that the regressions including both genders and only men have fewer significant variables. Furthermore, that the variables having young children and marital status are significant and positive for male labour force participation can also be connected to cultural structures where the man generally is seen as the family provider and also to the joint household labour supply model. Interesting is that the ranking of different institutions is the opposite compared to when female labour force participation is looked upon, where education at a professional institutes has the largest impact, followed by education at a technical centre, followed by the smallest impact of university education.

6.3 Concluding remarks

In this thesis I examine the relationship between higher education and female labour market participation in Chile. The purpose of this thesis is to increase understanding about the relationship and enable for more efficient policy implementation, which may help Chile maintain steady economic growth and in the long run increase gender equality. To do this, I disentangle the effects of different types of institutions of higher education rather than analysing the joint effect of higher education on female labour market participation. The division allows me to analyse each corresponding effect on female labour market participation, which has not been done in any study before and consequently contributes to better comprehension of how education affect female labour market participation. In Chile the officially recognised institutions of higher education are universities, professional institutes, and technical centres. University education is generally the most expensive where a degree is obtained after five years, education at a professional institute is generally less expensive where a degree is obtained after four years, and education at a technical centre is the least expensive where a degree is obtained after two years. By using data from the national census, and comparing results from the probit model and the LPM, I show that university education seem to have the largest effect on female labour market participation, that education at technical centres seem to have a slightly smaller effect, and that education at a professional institute seem to have the smallest effect. The results are significant and robust in multiple specifications, but the variables are also subject to endogeneity which generates biased results, wherefore the exact sizes of the effects are not discussed but rather their signs and relative sizes. Additionally, after concluding that both models suffer from heteroscedasticity I argue that the results obtained in the LPM are the most reliable because the estimator is still consistent. Furthermore, by complimenting the thesis with my MFS about women's policy preferences, I am able to discuss policy implementation with more authority than studies that only rely on economic theory. The MFS is valuable for this thesis because it contributes to increased understanding of labour market structures in Chile, but foremost because it supports active policy work and enables for development of more efficient policies. The analysis is also based on new data, which is an advantage for policy makers. My results where different institutions have different effects on female labour market participation suggest that pre-market discrimination and cultural structures may have large explanatory power regarding female labour market participation in Chile. With support from my MFS I argue that policies that aim to simplify the combination of family life and career may be an efficient way to increase female labour market participation among women with higher education. The women who answered my survey further emphasise the importance of quality

of day care centres, which was valued higher than both cheaper day care centres and more accessible day care centres. The highest valued policy in the MFS was work concerning the gender wage gap. I believe that this policy is of great importance because it may decrease the impact of cultural values on labour market decisions, demonstrate economic opportunities for women, and encourage women to invest in higher education and a careers.

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Appendix I: Tables

Table 6: Descriptive statistics

All	Min.	Max.	Obs.	Mean	Std. Dev.
lf	0	1	50681	0.523	0.499
uni	0	1	68197	0.034	0.181
prof	0	1	68197	0.009	0.092
tech	0	1	68197	0.015	0.122
ysch	0	18	62994	8.544	4.660
age	0	100	68197	31.580	20.826
age ²	0	10000	68197	1431.006	1616.477
ch5	0	5	68197	0.123	0.374
mas	0	1	68197	0.405	0.491
na	0	1	66860	0.986	0.117
re	0	1	50681	0.874	0.332
disa	0	1	68197	0.022	0.148
geo	0	1	68197	0.318	0.466
sex	0	1	68197	0.492	0.500

Women	Min.	Max.	Obs.	Mean	Std. Dev.
lf	0	1	26006	0.357	0.479
uni	0	1	34642	0.030	0.171
prof	0	1	34642	0.008	0.088
tech	0	1	34642	0.016	0.126
ysch	0	18	32071	8.493	4.630
age	0	100	34642	32.394	21.318
age ²	0	10000	34642	1503.814	1692.559
ch5	0	5	34642	0.138	0.393
mas	0	1	34642	0.396	0.489
na	0	1	34136	0.986	0.116
re	0	1	26006	0.903	0.296
disa	0	1	34642	0.021	0.143
geo	0	1	34642	0.315	0.464

Men	Min.	Max.	Obs.	Mean	Std. Dev.
lf	0	1	24675	0.701	0.458
uni	0	1	33555	0.038	0.190
prof	0	1	33555	0.009	0.097
tech	0	1	33555	0.014	0.117
ysch	0	18	30923	8.598	4.690
age	0	100	33555	30.740	20.271
age ²	0	10000	33555	1355.839	1530.371
ch5	0	5	33555	0.106	0.352
mas	0	1	33555	0.414	0.493
na	0	1	32724	0.986	0.119
re	0	1	24675	0.843	0.364
disa	0	1	33555	0.024	0.153
geo	0	1	33555	0.322	0.467

Table 7: Robustness

Variables	(7) lf	(8) lf	(9) lf	(10) lf	(11) lf
uni	0.447*** (9.363)	0.190*** (12.02)	0.407*** (8.070)	0.166*** (10.87)	0.178*** (11.66)
prof	0.188** (2.256)	0.0998*** (3.404)	0.116 (1.347)	0.0799*** (2.851)	0.0855*** (3.053)
tech	0.330*** (5.766)	0.147*** (7.298)	0.257*** (4.356)	0.130*** (6.755)	0.134*** (6.941)
ysch	0.0908*** (39.06)	0.0298*** (40.55)	0.0777*** (29.36)	0.0249*** (32.04)	0.0255*** (32.67)
age			0.157*** (46.01)	0.0343*** (43.59)	0.0348*** (43.97)
age ²			-0.00185*** (-45.97)	-0.000379*** (-45.88)	-0.000383*** (-46.09)
ch5			-0.104*** (-5.170)	-0.0227*** (-3.562)	-0.0166*** (-2.605)
mas			-0.574*** (-28.84)	-0.167*** (-27.40)	-0.174*** (-28.39)
re			-0.349*** (-12.48)	-0.118*** (-13.07)	
na					-0.0397* (-1.751)
disa			-0.754*** (-8.762)	-0.0895*** (-5.078)	-0.0848*** (-4.795)
geo			0.0435** (2.295)	0.0123** (2.057)	0.0248*** (4.149)
Constant	-1.299*** (-54.55)	0.0575*** (7.933)	-3.381*** (-46.03)	-0.342*** (-17.33)	-0.435*** (-15.07)
Observations	25,939	25,939	25,939	25,939	25,566
Pseudo R ² , R ²	0.080	0.100	0.177	0.182	0.181

*** p<0.01, ** p<0.05, * p<0.1; z-statistics in parentheses regression 7, 9; t-statistics in parentheses regression 8, 10; pseudo R² reported regression 7, 9; R² reported regression 8, 10, 11. Robust standard errors are used in regression 11

Appendix II: Minor Field Study

AII.1 Introduction

In Chile, public policies for gender equality have historically been influenced by conservative politicians aiming to maintain the traditional role of women as wives and mothers. During the last decade this has started to change where gender equality has become an important matter and female labour market participation is increasing (Stange et al. 2011, p. 280). To be able to implement successful policies to increase female labour market participation further, it is important to evaluate how policies are valued among those the policies are aimed for. Without consideration to what the women want, policies may in worse case not only be inefficient but also wasteful.

Hence, to complement the thesis my minor field study (MFS) aims to evaluate how female students in Santiago de Chile perceive the labour market in regards to gender equality, how important they find active work towards a more gender equal labour market to be, and examine how different policies are valued. By fulfilling this purpose I increase understanding of the Chilean labour market mechanisms and enable for more efficient implementation of policies.

The purpose is achieved by distribution of a survey to students in Santiago de Chile, where results are presented descriptively. The MFS consists of five sections, including this introduction. The second section describes the methodology. The third section presents the results, and the fourth section discuss the results briefly and present conclusions. The fifth section show the survey.

AII.2 Methodology

The survey is distributed on 17 institutions of higher education in Santiago de Chile. To obtain a representative selection of students all answers are treated confidentially with the aim to include students with different focus of their studies, students from different socio-economic groups, and institutions with different geographical locations. To select which institutions to visit the institutions are divided into four groups after yearly tuition fees; 2000-3499 US dollar, 3599-5499 US dollar, 5500-7499 US dollar, and 7500-8500 US dollar. The program of business administration and economics is selected to represent the tuition fee of the institutions. The usage of a representative program is needed because different institutions have different tuition fees and program offers. The program of business administration and economics is found in all

universities and is thus easy to compare. The last step in the selection process is consideration of different geographical locations.⁸

The survey is designed after considering survey techniques presented in Dahmström (p. 76, 2005) where control of understanding, measurement errors, and neutrality is considered. The first part of the survey concerns individual characteristics including age, relationship status, field of study, work status, usage of student loans, education and work characteristics of the parents, and lastly work aspirations after completion of a study program. Relationship status is interesting because it has been shown that women in relationships think more about getting married and having children (Hawley, 1971) and human capital theory suggest that women intending to spend more time at housework will invest less in education (Borjas, 2013, p. 52). Bickhard (1992) state that individuals perceive situations differently depending on their environment, e.g. home and school at early stages in life. For this reason it is also interesting to collect information about usage of student loans and work status, as well as parental characteristics about education and work. Age and field of study are included to ensure a representative sample and work aspirations is interesting for comparative statistics.

The second part of the survey covers the student's perceptions of gender equality in the labour market, how important they find active work for increased gender equality in the labour market to be, and further evaluates how the students value traditional policies aiming to increase female labour market participation. The students are asked to rank how they perceive the labour market in regards to gender equality where zero represents a market without any gender equality and five represents a completely gender equal market. Perceptions are subjective, but with a representative sample of students it is still interesting to examine. The students are further asked to rank how important they consider it to be that the government and other institutions actively work for a gender equal labour market where zero represents the view of it not being important and five the view of it being very important. For the last question the students are asked to rank

⁸ Visited institutions from tuition fee group one: Universidad Iberoamericana de Ciencias y Tecnología, Universidad Internacional SEK, Universidad Tecnológica de Chile Inacap, Universidad Arturo Prat.
Visited institutions from tuition fee group two: Universidad san Sebastian, Universidad del Pacífico, Universidad de Artes, Ciencias y Comunicación, Universidad Tecnológica Metropolitana.
Visited institutions from tuition fee group three: Universidad de Chile (2 campuses), Universidad Técnica Federico Santa Maria, Universidad Diego Portales.
Visited institutions from tuition fee group four: Universidad de Desarrollo, Pontificia Universidad Católica de Chile (3 campuses).

six traditional policies aiming to increase female labour market participation, where zero represents the view of it not being important and five the view of it being very important.

Presentation of the answers is done using descriptive statistics. The survey is translated to Spanish to obtain the highest amount of complete answers.⁹

AII.3 Results

AII.3.1 Descriptive statistics

The survey is distributed in Santiago de Chile during the period of June 2, 2015 to June 18, 2015, during which 113 surveys are answered. 20 surveys are answered by tuition fee group one, 24 surveys from group two, 28 surveys from group three, and 41 from group four. 52.7 percent of the students reported to be in a relationship. The average age of the participants is 22.3 years, with a standard deviation of 4.5 years, the youngest 17 years old and the oldest 42 years old. 30.9 percent of the women works regularly, 35.4 percent works occasionally, and 33.6 percent does not work. 55.8 percent use or have used a student loan. The student’s field of study is presented in table 8.

Table 8: Field of study

Field of study ¹⁰	1	2	3	4	5	6	7	8
Frequency	18	33	2	16	9	9	22	2

There is no big difference in educational attainments between the mothers and the fathers, and the parents are fairly highly educated where 59 percent, same for both mothers and fathers, have some kind of higher education. Between occupations mothers and fathers differ more. 88.9 percent of the fathers are reported part of the labour force, while only 64.3 percent of the mothers are. The main activity of 28.3 percent of the mothers is reported to be housework, which was not reported for any father. The sample thus shows similar characteristics to the statistics reported by Stange et al. (2011, p. 280).

Contradicting the statistics reported by Stange et al. (2011, p. 280), all women answered that they will work after obtaining their degree. Regarding the length of the work 55.8 percent reported that they will work until retirement. The remaining majority reported not knowing how

⁹ See section AII:5 for survey formulation in Spanish and English

¹⁰ 1=law, 2=medicine, 3=nature science, 4=business/economics, 5=engineering, 6=aesthetics, 7=humanities, 8=political science

long they would work and a few reported they would work less than to retirement. One woman answered that she does not plan to continue working after getting married and one woman reported she would not continue working after having children.

No student declined to answer the survey during the period of distribution, through which it may be concluded that any possible bias arising from unobserved characteristics between participants and non-participants may be ignored.

AII.3.2 Survey criticism

The survey covers the most common fields of studies to get a representative sample of students, it can however be noted that science students and political science students are not well represented in the sample. After evaluation of program structures a common structure if found to be a combination of humanities and political science which may explain the low amount of students having political science as their main focus. A consequence of the lack of representation may be that the results are biased towards the views of the students from more represented study fields. There are also more respondents from tuition group four than from any other tuition fee group, with the similar consequence of a possible bias in the results towards the perceptions and views of groups four.

The MFS is conducted in Santiago de Chile, and does not incorporate any students in other cities. The geographical delimitation for the survey is practical. Chile's population was estimated to over 17.6 million people in the end of 2013. In the area of Santiago de Chile the population was estimated to 6.68 million (The World Bank, 2015). It is the area in Chile having the most diversified population, which gives the best possibilities to get a representative sample of students.

Questions about the future, in the survey about future labour market aspirations, are hard to evaluate because it only covers individuals intentions and may not reflect the later outcome. Because of this, and the large part of the sample answering that they do not know how long they will work, the answers will not be analysed more in detail.

Answers may also be subject to a bias towards more socially accepted views, especially the question about the importance of active work towards a more gender equal labour market and regarding the different policies. This risk is however reduced as the survey is anonymous and answered individually.

Despite the critique mention above, the group is fairly homogenous and I believe the sample is sufficient for the purpose of the study.

AII.3.3 Results

This section presents the results obtained in the survey. Table 9 presents the results regarding the first two questions and reports mean values, 95% confidence intervals, standard errors, number of observations, minimum values, and maximum values.

Table 9: Perceptions and views of gender equality in the labour market

Variable	Mean	95% CI	Std.E.	Obs.	Min.	Max.
Perception of gender equality in the labour market	2.07	1.88-2.27	0.10	111	0	5
Importance of work towards gender equality	4.28	4.06-4.51	0.11	110	0	5

Perceptions of gender equality in the labour market has a mean value of 2.07, and the importance of work towards gender equality has a mean value of 4.28.

Table 10 presents how the students value different policies.

Table 10: Ranking of policies

Policy	Mean	95% CI	Std.E.	Obs.	Min.	Max.
No wage discrimination	4.81	4.64-4.97	0.08	98	0	5
Improved quality of day care centres	4.66	4.53-4.80	0.07	98	2	5
Improved infrastructure	4.54	4.36-4.71	0.09	97	2	5
More accessible day care centres	4.48	4.30-4.66	0.09	98	0	5
Cheaper day care centres	4.22	4.02-4.43	0.10	98	0	5
Changed parental leave regulations	4.04	3.77-4.31	0.14	97	0	5

No wage discrimination is the policy considered the most important, followed by improved quality of day care centres, improved infrastructure, more accessible day care centres, cheaper day care centres, while changed parental leave regulations is considered the least important. Further analysis with t-tests show that no wage discrimination is found significantly more important than cheaper day care centres and changed parental leave regulations, and changed parental leave regulations is in addition to gender wage discrimination found significantly less important than improved quality of day care centres and improved infrastructure.

AII.4 Conclusions

AII.4.1 Discussion

The analysis regarding perceptions of gender equality in the labour market suggest that the general perception is of a quite unequal labour market with the mean value of 2.07. A drawback in the analysis is that the only numbers with a written corresponding interpretation is zero and five. A mean value of 2.07 is relatively low on the scale, but exactly what situation it corresponds to is hard to say. It is however certain that there is significant room for improvement. The results on views of the importance of active work from the government and other institutions towards a more equal labour market in regards to gender suggest that students find this work quite important with a mean value of 4.28. Also here interpretation of the number cannot be done, but as five has the corresponding meaning of it being very important it can be argued that students find it at least important.

Regarding policies the students seem to value all policies rather highly with mean values ranging between 4.04-4.81. The problem of only having written interpretations of the values zero and five remains. The results suggest that no gender wage discrimination may be the most important policy among students, and that changed parental leave regulations may be the least important policy. Among the policies concerning day care centres improved quality is the highest values one, significantly more important than cheaper day care centres. The differences are however relatively small and rather than discussing which policy that is more important the results suggest that all policies are considered important.

One option for evaluating the policies in a different way is to let individuals rank the policies between each other, and not individually, and further give weights to their rankings to capture if any policy is more heavily emphasised.

AII.4.2 Conclusions

For final conclusions, female students in Santiago de Chile perceive the labour market to be rather unequal in regards to gender and they find active work towards a more equal labour market important. The findings suggest that students are aware of the problem of gender equality in the labour market, and further that they want to see change and a more gender equal environment. The conclusion that can be made regarding policies is that students in general have a very positive attitude towards the traditional policies aiming to increase female labour market participation. It further supports more action to be taken towards achieving a more gender equal labour market in Chile.

This MFS contributes to increased understanding of the Chilean labour market, which consequently enables for more well-founded discussions and conclusions to be made in the thesis.

AII.5 Survey formulation

The survey is translated to Spanish by René Pardakhty Dokhany.

Percepción de los estudiantes de nivel superior en relación a la equidad de género en el mercado laboral chileno

Mi nombre es Malin Berg von Linde y estoy realizando un estudio para una universidad sueca. Gracias de antemano por ayudarme con esta encuesta que tan sólo tomará 2-3 minutos y es completamente anónima.

La finalidad de esta encuesta es poder investigar cómo perciben los estudiantes universitarios de Santiago el mercado laboral desde el punto de vista de la equidad de género.

Módulo I: Características personal

1. Género: Masculino Femenino **2. Edad:** _____ **3. ¿Tienes pareja?:** Sí No

4. ¿Estás estudiando en la universidad, centro técnico u otro centro de estudios de nivel superior?

Sí No, pero planeo continuar o empezar un estudio No (si marcas “no”, has terminado)

5. El enfoque principal de mis estudios es:

Derecho Medicina Ciencias Naturales Administración de empresas/Economía
 Ingeniería Estético Humanidades Ciencias políticas
 Vocational Otro: _____

6. ¿Has trabajado durante tus estudios?

Sí, regularmente Sí, esporádicamente No Otro _____

7. ¿Eres o has sido en algún momento beneficiario de un crédito o beca de estudios?

Sí No Otro _____

8. El nivel de estudios más alto que tienen tus padres es:

Madre:

Posgrado Título universitario Título técnico Escuela secundaria Escuela primaria

Padre:

Posgrado Título universitario Título técnico Escuela secundaria Escuela primaria

9. Actualmente tus padres están:

Madre:

Trabajando No trabajando (cesante) Dueña de casa Jubilado Otro _____

Padre:

Trabajando No trabajando (cesante) Dueño de casa Jubilado Otro _____

10. ¿Planeas trabajar después de completar tus estudios?

- Sí No Otro _____

Si la respuesta a la pregunta 10 fue “sí”, por favor responde las siguientes 3 preguntas:

11.1 ¿Cuánto tiempo planeas trabajar?

- 1-5 años 6-10 años 11-20 años Hasta jubilarme No lo sé

11.2 En caso de casarte, ¿Planeas seguir trabajando después de casarte?

- Sí No No lo sé Ya estoy casado No me quiero casar
Otro _____

11.3 ¿Planeas seguir trabajando en caso de tener hijos?

- Sí No No lo sé Ya tengo hijos Otro _____

Si la respuesta a la pregunta 10 fue “no”, por favor responde la siguiente pregunta:

11.4 ¿Cuál crees que será tu principal actividad?

- Dueña/o de casa Trabajos voluntarios No lo sé Otro _____

Módulo 2: Percepción de equidad de género en el mercado laboral chileno

**1. ¿Qué tan igualitario crees que es el mercado laboral chileno en relación al género?
(0 = no igualitario en absoluto, 5 = muy igualitario)**

- 0 1 2 3 4 5

2. ¿Qué tan importante crees que el gobierno y otras instituciones trabajen activamente para aumentar la participación laboral de la mujer? (0 = nada de importante, 5 = muy importante)

- 0 1 2 3 4 5

**3. Por favor asigna un número según su importancia a las políticas presentadas. Éstas políticas tienen por finalidad aumentar la participación de la mujer en el mercado laboral.
(0 = poca importancia, 5 = muy importante)**

- _____ Sueldo igualitario, independiente del género
_____ Más sala cunas y de mejor acceso geográfico.
_____ Sala de cunas más baratas.
_____ Mejor calidad de las sala de cunas
_____ Reformas de infraestructuras (mejor transporte público, nuevos caminos)
_____ Aumento periodo pre y/o post natal

Student's Perceptions and Views on Gender Equality in the Chilean Labour Market.

My name is Malin Berg von Linde, I am a master student at Lund's University in Sweden. I am currently writing my thesis about the Chilean labour market, what for I am distributing this survey that takes 2-3 minutes to complete and is completely anonymous.

The purpose of this survey is to investigate how students in Santiago de Chile perceive and view the labour market in regards to gender equality.

Part I: Personal characteristics

1. Gender: Male Female **2. Age:** _____ **3. Do you have a partner?** Yes No

4. Are you currently studying at a university or other institution of higher education?

Yes No, but I plan to continue or start a study program soon No (if no, you are finished)

5. The main focus of my studies is:

Law Medicine Nature science Business administration/Economics

Engineering Aesthetics Humanities Political science

Vocational Other _____

6. Are you working during your studies?

Yes regularly Yes, sometimes No Other _____

7. Do you, or have you at some point during your studies, used a student loan?

Yes No Other _____

8. What is the highest completed education of your parents?

Mother:

PhD University degree Technical degree Secondary school Primary school

Father:

PhD University degree Technical degree Secondary school Primary school

9. Your parents are currently:

Mother:

Working Not working (unemployed) Housework Retired Other _____

Farther:

Working Not working (unemployed) Housework Retired Other _____

10. Do you plan to work after completing your studies?

Yes No Other _____

If the answer to question 10 was yes, please answer the following 3 questions:

11.1 How long do you plan to work?

1-5 years 6-10 years 11-20 years Until retirement I don't know

11.2 If you get married, do you plan to work after that?

Yes No I don't know I am married I don't want to get married Other _____

11.3 Do you plan to work after having children?

- Yes No I don't know I have children Other _____

If the answer to question 10 was no, please answer the following questions:

11.4 What will be your main activity after your studies?

- Housework Volunteer work I don't know Other _____

Part 2: Perceptions of gender equality in the Chilean labour market

1. How equal in regards to gender do you consider the Chilean labour market to be? (0 = not equal at all, 5 = completely gender equal)

- 0 1 2 3 4 5

2. How important do you consider it to be that the government and other institutions actively work towards raising the female labour market participation rate by making it easier for women to enter the labour market? (0 = not important, 5 = very important).

- 0 1 2 3 4 5

3. Please rank the following policies aiming to increase female labour market participation (0 = not important, 5 = very important).

- _____ No wage discrimination
- _____ Geographically accessible day care centres
- _____ Cheaper day care centres
- _____ Better quality of day care centres
- _____ Infrastructural reforms (better public transport, new roads)
- _____ Changed parental leave regulations (more paternity leave days)